

"PRINTING DEVICE"

This invention relates to a paper tractor mechanism, e.g. a paper tractor mechanism of a printing device for printing a continuous paper sheet, and to a printing device provided therewith.

5 Paper supplied to a printing device for printing thereby may be in the form of a continuous paper sheet or in the form of separate or cut sheets. The cut sheets may be moved through the printing device by means of a drive roller and a pinch roller, while a paper tractor may be used when continuous
10 paper is to be printed.

 Furthermore, since the printing device may be required to print on a variety of paper sheets of different sizes, paper feed ports which correspond to the sizes of these paper sheets must be provided.

15 Therefore, a drive roller and a pinch roller may be provided for effecting movement of the cut sheets, while printing on continuous paper needs a paper tractor.

 Thus, if the printing device is provided with a number of paper outlet ports corresponding to the number of different
20 kinds of cut sheets and the continuous sheets, the size of the whole printing device becomes too large.

 If one single paper outlet port for both the cut sheets and the continuous paper would be sufficient, the size of the device could be reduced. However, if the printing device

includes ancilliary equipment such as, for example, a page arrangement mechanism, the presence of the paper tractor for drawing the continuous paper through the printing device may make the provision of such ancilliary equipment difficult.

5 According to the present invention, there is provided a printing device having support means on which is mounted a paper tractor unit, the paper tractor unit being movable between a paper removal position, in which the paper tractor unit is arranged to draw a web of paper from a printing position,
10 and a paper feed position in which the paper tractor unit is arranged to feed a web of paper to the printing position, and a pair of rollers between which in operation passes the printed paper from the printing position in both positions of the paper tractor unit.

15 In its preferred form, the printing device can have one place which is used as a removal port for both cut sheets and continuous paper sheet, and the paper tractor unit can be arranged to be capable of being used for feeding continuous paper sheet and for removing paper. Furthermore, a special
20 mechanism such as a paper arrangement mechanism and so forth can be easily provided, and an interchange between the continuous paper and the cut sheets can be quickly effected.

 The pair of rollers may comprise a drive roller, and a pinch roller which is movable into and out of contact
25 with the drive roller.

 Preferably, movement of the paper tractor unit between its two positions causes movement of the pinch roller between positions in which it is respectively in and out of contact with the drive roller.

The pinch roller may be rotatably mounted on a movable support plate, the movable support plate being engaged by a release lever which is moved by the paper tractor unit when the latter is moved between its two positions.

5 The movable support plate may be provided with a pinion which meshes with a rack, rotation of the pinion causing the movable support plate to move so that the pinch roller is moved towards or away from the drive roller.

10 If desired, with the paper tractor unit in the paper feed position, the paper discharge path and the paper feeding path are substantially parallel each other at a distance of a diameter of said platen. The said tractor unit may be inverted between the said paper removal position and said paper feed position.

15 The said paper tractor unit may have a paper drawing portion and a paper pushing portion opposing each other, so arranged that continuous web paper is drawn from the said printing position through the paper drawing portion when the said paper tractor unit is in the said paper removal
20 position and is fed to the said printing position through the said paper pushing portion when the paper tractor unit is in the paper feed position.

25 The invention also comprises a paper tractor unit which is mounted on a support means for movement between first and second positions, and means for driving the paper tractor unit so as to feed paper therethrough, the direction in which paper is passed through the paper tractor unit depending upon whether the paper tractor unit is in the first or the second position.

30 When a cut sheet is to be printed, the tractor unit may be disposed in the position at which the continuous

paper is fed to the printing position, while the cut sheet is removed from the printing position by means of the drive roller and the pinch roller.

When, however, continuous paper is to be printed, one of two paper feeding methods can be selected. If the tractor unit is shifted to communicate with a selected continuous paper feed port, the continuous paper may be fed by means of the tractor unit, and may be pulled by means of the drive roller and the pinch roller.

If the tractor unit is out of communication with another selected continuous paper feed port, the tractor unit may be rotated so that it is moved from the paper feed position to the paper removal position, and then the continuous paper is supplied to the unit so that the paper is pulled therethrough.

In this state, the release lever is operated by means of the rotation of the tractor unit, whereby the support plate on which the pinch roller is provided is moved along a guide portion. As a result of this, the pinch roller is moved away from the drive roller which moves the paper. Therefore, continuous paper can be smoothly supplied to the tractor unit which communicates with the paper removal port, whereby the continuous paper is removed by means of this unit.

When there is a change over from the printing of the continuous paper to the printing of the cut sheets, the tractor unit may be rotated so as to be moved from the position

at which the paper is removed to the position through which the paper is fed, and as a result of this movement, the release lever is restored to its original position.

Consequently, the pinch roller again abuts against the drive roller, whereby the cut sheets may be moved thereby.

The invention is illustrated, merely by way of example, in the accompanying drawings, in which:-

Figure 1 is a cross-sectional view of a printer provided with a paper tractor mechanism according to the present invention,

Figure 2 is an enlarged cross-sectional view of a paper feed means forming part of the printer of Figure 1;

Figure 3 is an enlarged cross-sectional view of another part of the printer of Figure 1, showing the said paper tractor mechanism;

Figure 4 is a plan view of a tractor unit forming part of the said paper tractor mechanism;

Figure 5 is a front view of a base plate to which the tractor unit of Figure 4 is fitted; and

Figure 6 is a front view of a drive transmission mechanism forming part of the printer of Figure 1.

Referring to Figure 1, a printing device has a platen 2 which is rotatably mounted on a shaft 2a.

The shaft 2a extends between side plates 1 and 1A (see Figure 6) which form a frame of the printer and are disposed opposite to each other. The platen 2 is disposed opposite to a printing head 3. The printing head 3 is mounted on a carriage 4 which can be horizontally reciprocated along two guide shafts 5, 6. A ribbon cassette 7 is provided behind the printing head 3. Means for driving the carriage 4 comprise, as known, a projection 4a which is integrally formed with the carriage 4 and which is connected to an endless belt 8, the endless belt 8 being driven by a drive pulley 10 which is rotated by a carriage motor 9 (see Figure 6).

Record paper to be printed is introduced into a space formed between the platen 2 and the printing head 3.

A paper feed port from which the record paper is supplied to the printing position and a guide passage for introducing the record paper to the printing position will now be described.

Cut sheet feed ports are disposed in the front surface of the outer case (lefthand side of Figure 1) of the printing device so that they form two vertical stages consisting of paper feed ports A and B. A cartridge (not shown) which accommodates the cut sheets is disposed

at each sheet feed port, whereby the cut sheets can be supplied therefrom to the printing position.

5 If continuous paper is to be used, two paper feed ports are used consisting of a paper feed port C, which is disposed beneath the paper feed port B for the cut sheet, and a paper feed port D, which is disposed in the upper portion of the rear of the printing device (right hand side of Figure 1).

10 The two paper feed ports A, B which are provided for the cut sheets and the two paper feed ports C, D which are provided for the continuous sheet are provided for the purpose of facilitating a change in the size of the record paper sheets.

15 The construction of the guides for introducing the record paper to the printing position from the paper feed ports A, B and C will now be described. A guide passage is formed by a support plate 11 and by guide plates 12a, 12b, 12c and 12d. Another guide passage is formed from the paper feed port D by a guide plate 12e which is
20 spaced from the support plate 11.

When the cut sheets are fed by hand, the paper feed port A can be used and a guide member 13 is arranged to be used.

The construction of driving means for feeding the continuous paper so as to pass above the platen 2 will now be described with reference to Figure 1 and Figure 2 which is an enlarged view of a portion thereof.

5 On the rear of the support plate 11 there is provided a projecting mounting plate 14. A lever 16 is pivotally mounted on a shaft 15 supported by the mounting plate 14. A shaft bearing groove 11a is formed in the mounting plate 14. A shaft 17a of a pinch roller 17 is longitudinally and
10 rotatably mounted in the shaft bearing groove 11a. The lower end portion of the lever 16 is resiliently urged into contact with the shaft 17a of the pinch roller 17. The necessary spring force for this is provided by a spring 18 which is secured to the top end portion of the lever
15 16. The pinch roller 17 projects through a hole in the support plate 11 and so into a guide passage 11b where it is resiliently urged into contact with a drive roller 19 for feeding paper. The drive roller 19 is journaled on a drive shaft 19a which transmits drive to the drive roller 19.

20 A paper feed mechanism for effecting travel of the cut sheets (or sometimes for effecting travel of the continuous paper) at a position E from which the record sheets are moved so as to pass across the platen 2 will now

be described with reference to Figure 1 and with reference to Figure 3 which is an enlarged view of a portion thereof.

5 A drive roller 20 for effecting movement of the paper is rotated by effecting rotation of its shaft 20a. A pinch roller 21 is resiliently urged into contact with the drive roller 20, whereby the printed record paper is moved by passing through the nip of the rollers 20, 21. The pinch roller 21 can be moved into contact with the drive roller 20 and away from the latter. The pinch roller 21 forms part of a unit comprising a rotational shaft 21a on which the 10 pinch roller 21 is mounted, the shaft 21a being supported by a support plate 22. A guide shaft, for example, a shaft 23a of a pinion 23, is rotatably mounted on the support plate 22, the pinion 23 being disposed in a guide hole 24 which is provided in the side plate 1. At one end and on one 15 side of the guide hole 24 there is provided a rack 24a with which the pinion 23 is adapted to mesh. Therefore, when the pinion 23 is brought into engagement with the rack 24a and is rotated, it is moved upwardly in the guide hole 24 so that the support plate 22 is also moved upwardly. 20 As a result of this, the pinch roller 21 is moved away from the surface of the drive roller 20.

Another pinch roller unit whose construction corresponds to that described above is also provided for the other

side-plate 1A at the corresponding position.

5 The rack 24a is formed in the guide hole 24 thereof so that the horizontal movements of the pinion 23 are made uniform. A recess 24b is formed in the inner surface of the guide hole 24 on the side thereof opposite to the rack 24a for the purpose of facilitating manual raising of the support plate 22 up to the top end of the guide hole 24 and thus the engagement of the shaft 21a of the pinch roller 21 with the recess 24b so that an ink ribbon
10 can be exchanged when the parts are in this position.

 Movement of the pinch roller 21, which is resiliently urged into contact with the drive roller 20, away from the latter is effected by means of a release lever 25 for releasing the pinch roller 21. The release lever 25 is
15 rotatably mounted on the side plate 1 by means of a shaft 25a, the release lever 25 being movable into contact with a projection 22a of the support plate 22, so as to move the latter.

 The movement of the release lever 25 is performed in
20 unison with the rotation of a tractor unit T, and the details thereof will be described hereinafter.

 The tractor unit T may be disposed at a feed position F for the purpose of supplying the continuous paper to the

printing position. When the tractor unit is so disposed, the paper supply port D is used for feeding the continuous paper to the printing position. On the other hand, the tractor unit T can be inverted to a paper removal position E for the purpose of effecting removal of the continuous paper from the printing position. The movement of the tractor unit T between the paper feed position F and the paper removal position E and the construction of the unit T will now be described.

10 A projection 27a of a base plate 27 (see Figure 5) on which the tractor unit T is mounted is rotatably journaled on a shaft 26 which is supported by the side plate 1. The base plate 27 is provided with a handle 27b for inverting the unit T and a through hole 27c through which a drive shaft 28 (see Figure 4) passes and a through hole 27d
15 through which a support shaft 29 (see Figure 4) passes.

A base plate 27 is attached to each of the opposite sides of the tractor unit T shown in Figure 4. A drive gear wheel (which is given reference numeral 42 in
20 Figure 6) and a rotary gear wheel are rotatably mounted on the drive shaft 28 and the support shaft 29 in a space formed by the outer frame of the unit. A drive belt 30

is arranged to extend about the gear wheels. Sprockets 30a project above the top surface of the belt 30. A cover 31 is provided for the sprockets 30a, the cover being movable to an open position in which the sprockets 30a are exposed. The cover 31 may be opened when the record paper is to be exchanged. A click spring is provided for the cover 31. Although the horizontal position of the tractor unit T can be adjusted by moving it along the shafts 28 and 29, the unit can be locked at a certain position by a lock lever 32 which is mounted on the support shaft 29.

As shown by a continuous line in Figure 3, the tractor unit T, which is positioned at the feed position F for the continuous paper, may be moved within a guide groove 1a by holding the handle 27b of the base plate 27 thereof and rotating the tractor unit T counter-clockwise relative to the shaft 26. As a result of this, the tractor unit T can be positioned at the paper removal position E shown by a long and short-dash line in Figure 3.

As a result of this inverse rotation of the tractor unit T, the corner of the base plate 27 rotates the release lever 25 clockwise about the shaft 25a. Therefore, the support plate 22 is moved upwardly along the guide hole 24, and thus the resilient contact between the pinch roller 21 and the drive roller 20 is released.

The drive transmission will now be described with reference to Figure 6.

5 A paper feed motor 33 is disposed in the lower portion of the side plate 1A. A gear 34 is engaged with a pinion 33a which is journaled on a drive shaft of the motor 33. A pinion 34a of the gear 34 meshes with a drive gear 35 of the platen 2. The drive gear 35 is journaled on the shaft 2a of the platen 2 so that the platen 2 is rotated. The drive gear 35 of the platen 2 meshes with a pinion 36. A gear 36a of the pinion 36 meshes with a gear 37. The shaft 20a of the gear 37 constitutes the shaft of the drive roller 20. The gear 34 meshes with a gear 38 which meshes with a gear 39, The shaft 19a of the gear 39 serves as a drive shaft of the drive roller 19 for feeding the continuous paper, whereby the continuous paper which has been supplied from the paper feeding port C is passed to the platen 2.

10 The gear 34 meshes with a gear 40, and a pinion 40a of the gear 40 meshes with a gear 41.

15 The pinion 40a can be brought into engagement with a drive gear 42 of the tractor unit T when the tractor unit T is positioned at the paper feed port D (paper feed position F). The gear 41 is brought into engagement

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with the drive gear 42 when the tractor unit T is rotated inversely to the position E.

The operation of the embodiment shown in the drawings will now be described.

5 When continuous paper is supplied through the paper feed port D, the tractor unit T is positioned at the paper feed position F, whereby the paper is fed by the tractor unit T, and is then printed when the paper passes between the platen 2 and the printer head 3, and is pulled
10 by means of the paper feed drive roller 20 and the pinch roller 21.

 When cut sheets are to be printed, the paper feed ports A and B are used. The cut sheets are drawn
15 forwardly by means of the drive roller 20 and the pinch roller 21 after they have been printed. In this mode of operation, the tractor unit T is positioned at the paper feed position F, and the continuous paper is moved to wait at a position in front of the platen 2.

 A method of feeding the continuous paper through the
20 paper feed port C will now be described.

 As shown by the continuous line in Figure 3, the tractor unit T, which is positioned at the paper feed position F is rotated inversely relative to the shaft 26 as shown by the

long-and short-dash line in Figure 3, so that the tractor unit T is positioned at the paper removal position E. As described above, the pinch roller 21 is moved away from the drive roller 20 in unison with the inverse movement of the tractor unit T.

The continuous paper which has been drawn through the paper feed port C passes between the platen 2 and the printing head 3 and between the drive roller 20 and the pinch roller 21 which are positioned away from each other so as to be introduced into the tractor unit T disposed at the paper removal position E. The continuous paper is pulled by the tractor unit when printing begins.

In the device shown in the drawings, the tractor unit T can be used both for feeding the continuous paper and for removing the paper. Furthermore, since cut sheets and a continuous sheet can be disposed at one sheet movement position, the size of the printing device can be kept compact. Furthermore, when a cut sheet is printed, and a special device such as a page arranging mechanism is positioned at the sheet feeding position, the tractor unit can be moved inversely from the paper drawing position to the paper feeding position, while when the continuous paper is drawn by means of the tractor unit,

the pinch roller 21 can be moved away from the drive roller 20 for drawing paper. As a result of this, the setting of the continuous paper in the tractor unit can be facilitated.

C L A I M S

1. A printing device having support means on which is mounted a paper tractor unit, the paper tractor unit being movable between a paper removal position, in which the paper tractor unit is arranged to draw a web of paper from a printing position, and a paper feed position in which the paper tractor unit is arranged to feed a web of paper to the printing position, and a pair of rollers between which in operation passes the printed paper from the printing position in both positions of the paper tractor unit.
2. A printing device as claimed in claim 1, in which the pair of rollers comprises a drive roller, and a pinch roller which is movable into and out of contact with the drive roller.
3. A printing device as claimed in claim 2, in which movement of the paper tractor unit between its two positions causes movement of the pinch roller between positions in which it is respectively in and out of contact with the drive roller.
4. A printing device as claimed in claim 3 in which the pinch roller is rotatably mounted on a movable support plate, the movable support plate being engaged by a release lever which is moved by the paper tractor unit when the latter is moved between its two positions.
5. A printing device as claimed in claim 4, in which the movable support plate is provided with a pinion which meshes with a rack, rotation of the pinion causing the movable support plate to move so that the pinch roller is moved towards or away from the drive roller.
6. A printing device as claimed in any preceding claim, in which, with the paper tractor unit in the paper feed position, the paper discharge path and the paper feeding path are substantially parallel to each other at a distance of a diameter of said platen.



7. A printing device as claimed in any preceding claim, in which the said tractor unit is inverted between the said paper removal position and said paper feed position.

5 8. A printing device as claimed in claim 7, in which the said paper tractor unit has a paper drawing portion and a paper pushing portion opposing each other, so arranged that continuous web paper is drawn from the said printing position through the paper drawing portion when the said paper tractor unit is in the said paper removal position and is fed to the said
10 printing position through the said paper pushing portion when the paper tractor unit is in the paper feed position.

9. A printing device substantially as hereinbefore described with reference to and as shown in the accompanying drawings.
